24 (6)

AUTHOR: Filipovich, O. P. SOV/54-59-2-7/24

TITLE: Some Types of Equilibrium States in the Terrestrial Atmosphere (O nekotorykh tipakh ravnovesnykh sostoyaniy atmosfery)

PERIODICAL: Vestnik Leningradskogo universiteta. Seriya fiziki i khimii, 1959, Nr 2, pp 49-62 (USSR)

ABSTRACT: In investigating the state of the terrestrial atmosphere, a number of equilibrium states of the gas medium can be found. For the accurate mathematical and physical description, publications do not yet bring their complete determination, nor is there a unified standpoint on the physical nature for some of them. In this connection, this paper considers some basic types of equilibrium and puts forward their exact determination. Above all, those states were investigated which are of interest for the solution of various tasks of the theory of the upper terrestrial atmosphere. 1) Thermodynamic equilibrium: Some basic laws of the classic phenomenological thermodynamics (Kirchhoff) are indicated according to the book (Ref 1). These are integrated by a number of rules resulting from the statistic consideration of the state. In case of an ionization, the law of Sakh is fulfilled. The

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radiation intensity of this state is determined by a law of Plank (equation 10), the density of energy according to Stefan-Boltzmann (equation 11). 2) Local thermodynamic equilibrium: The thermodynamic equilibrium is disturbed by a number of causes which do not allow the simple way of consideration, but the latter is made possible by a separate consideration of volume units. 3) The monochromatic radiation equilibrium introduced by the astrophysicists is considered a little more closely. It occurs if the energy of the frequency is absorbed by any volume element and completely re-emitted by the same element. In its physical sense, this equilibrium is directly inverse to the local thermodynamic equilibrium. 4) Finally, a type of mixed equilibrium is considered: local thermodynamic equilibrium and monochromatic equilibrium exist in parallel at the same time. At the end of the article, the two stationary states (energetic and thermic) are dealt with. The radiation equilibriums and the connection between all equilibriums mentioned are discussed here. The stationary state is also considered in its connection with the distribution of atoms over the various energy levels. The

equation of the stationary state for a certain discrete atom level is given. This level is expressed by the statistic equilibrium of various transitions from above and from below, spontaneous radiation, unelastic collision of 1st and 2nd order, ionization, absorption. Finally, the author thanks Professor K. Ya. Kondrat'yev for valuable remarks. There are 8 references, 1 of which is Soviet.

SUBMITTED: May 22, 1958

66302
SOV/50-59-12-12/23

~~3~~ 3.5000

AUTHORS: Kondrat'yev, K. Ya., Filipovich, O. P.

TITLE: On the Theory of Thermal Conditions in the Upper Atmosphere

PERIODICAL: Meteorologiya i gidrologiya, 1959, Nr 12, pp 41-48 (USSR)

ABSTRACT: The results of the theoretical investigation of factors determining the vertical temperature distribution in the upper atmosphere are dealt with. Recent experimental data and theoretical results refute the conception of a radiation equilibrium in the stratosphere. Data of actinometric radio balloons show that active radiation changes with the altitude not only in the troposphere but also in the stratosphere. The paper by Ohring (Ref 31) is thoroughly discussed. The most important conclusion from this paper is that the stratosphere as a whole (between the tropopause and the 55 km level) is not in a radiation equilibrium. Although the papers (16, 20, 24, 36) convincingly show that the thermal conditions of the stratosphere are primarily controlled by radiation, the problem of the part played by other factors (in particular that of turbulent mixing) has remained unclarified up to date. On the basis of the papers (7, 30, 32) it can be said that an extensive area of the mesosphere (between 35 and 80 km altitude), from 30° on the northern

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hemisphere to 60° on the southern, is nearly in a radiation equilibrium. The most important characteristic of the mesosphere is the circumstance that its thermal conditions may be subject to a direct influence of the change in solar activity. Investigations in the thermo- and exosphere show that various authors obtained strongly varying temperatures for altitudes above 100 km. One of the causes is the circumstance that there is no connection between the various temperatures. Strictly speaking, the term of temperature is only applicable to a thermodynamic equilibrium. In the case of a nonequilibrium gas, it is very difficult to determine the connection between various temperatures. The assumption of a thermal equilibrium (Ref 2) at an altitude of 100-400 km can hardly be justified. It is more correct to speak of part equilibrium states with different degrees of freedom. In conclusion, the following is stated: It is quite natural to assume that the terrestrial atmosphere gradually loses its properties and - at an altitude of 2,000 - 3,000 km - comes into contact with the interplanetary gas. On the other hand, the temperature of the interplanetary gas is about 5,000°K.

FILIPOVICH, O.P.

PHASE I BOOK EXPLOITATION SOV/4878

Kondrat'yev, Kirill Yakovlevich and Ol'ga Petrovna Filipovich

Teplovoy rezhim verkhnikh sloyev atmosfery (Thermal Regime in the Upper Atmosphere) Leningrad, Gidrometeoizdat, 1960. 355 p. 3,000 copies printed.

Resp. Ed.: K. Ya. Kondrat'yev; Ed.: Yu. V. Vlasova; Tech. Ed.: M. I. Braynina.

PURPOSE: This book is intended for scientists interested in the physics and meteorology of the upper layers of the atmosphere. It will also be useful to advanced students of the field.

COVERAGE: The book systematically analyzes problems concerning the thermal regime in the upper layers of the atmosphere. Numerous observational data are presented and basic theoretical ideas, explaining the regularities of the thermal regime, are put forth. The latest scientific information on the composition and structure of the upper layers of the atmosphere is characterized in detail. Chapters III-VII were written by Kondrat'yev; Chapters I-II and VIII-X were written by Filipovich . The authors thank V. P. Gurov, S. P. Rodionov, S. I. Titov, and Ye. G. Shvidkovskiy. There are 472 references: 190 Soviet, 272 English, 7 German, and 3 French.

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Thermal Regime in the Upper (Cont.) SOV/4878

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Thermal Regime in the Upper (Cont.) SOV/4878

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AVAILABLE: Library of Congress

JA/dm/fal
3-20-61

FILIPOVICH, O.P.

Some calculations of the temperature distribution in the upper levels of the atmosphere. Vest LGU 16 no.16:66-76 '61.
(MIRA 14:8)
(Atmospheric temperature)

26764
S/054/61/000/003/002/003
B102/B203

10.1100 2607 2707 1327
3,5110

AUTHOR: Filipovich, O. P.

TITLE: Calculations of temperature distributions in the upper strata of the atmosphere

PERIODICAL: Leningradskiy Universitet. Vestnik. Seriya fiziki i khimii, no. 3, 1961, 66-76

TEXT: The author suggests a method of determining the temperature distribution in relation to altitude in the upper strata of the atmosphere by a simplified solution of the equation for heat conduction. For a plane atmosphere,

$$\frac{\partial}{\partial z}\left(\chi(z)\frac{\partial T}{\partial z}\right)+P-L=c(z)\frac{\partial T(z,t)}{\partial t} \qquad (10)$$

is valid in first approximation, c and χ being independent of time; χ is the heat-conduction coefficient; c is the specific heat of air; $\operatorname{div}(\chi\nabla T)+P-L=\frac{\partial}{\partial t}(cT)$; P and L are energy densities brought into or out of the volume element V in the form of heat; z is the altitude above a certain level. The difficult calculation of Eq. (10) is simplified by

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giving P(z,t), L(z,t) and T(z,t) in the form of time-mean values (mean values, barred) and fluctuations Δ... Thus one obtains, e.g., for temperature, the two independent equations

$$\frac{\partial}{\partial z}\left(\varkappa\frac{\partial\overline{T}}{\partial z}\right)+\overline{P}-\overline{L}=0, \qquad (12),$$

$$\frac{\partial}{\partial z}\left(\varkappa\frac{\partial\Delta T}{\partial z}\right)+\Delta P-\Delta L=c\frac{\partial\Delta T}{\partial t}. \qquad (13),$$

and therefrom

$$\overline{T}(z)=\overline{T}(z_0')+\varkappa(z_0)\frac{d\overline{T}(z_0)}{dz}\int_{z_0'}^{z}\frac{dz'}{\varkappa(z')}-\int_{z_0'}^{z}\frac{dz'}{\varkappa(z')}\int_{z_0}^{z'}|\overline{P}(z'')-\overline{L}(z'')|\,dz'', \qquad (14)$$

Finally,

$$\overline{T}(z)=\left((s+1)\left|\overline{T}^{s}(z_0)\frac{\partial\overline{T}(z_0)}{\partial z}A(z_0)\int_{z_0'}^{z}\frac{dz'}{A(z')}-\right.\right.$$

$$\left.\left.-\int_{z_0'}^{z}\frac{dz'}{A(z')}\int_{z_0}^{z'}(\overline{P}-\overline{L})\,dz''\right|+\overline{T}^{s+1}(z_0')\right)^{\frac{1}{s+1}}. \qquad (21)$$

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is obtained with $\varkappa(z) = A(z)T^s(z)$ and the time-averaged value $\bar{\varkappa} = A\bar{T}^s$ ($A = \frac{1}{3}\sqrt{\frac{3k}{m}}\frac{1}{\sigma}$, σ - collision cross section, and $s = 1/2$). The following must be known for determining the temperature distribution: a) the altitude distribution of the absorbed thermal energy ($\bar{P}(z) - \bar{L}(z)$), b) the altitude dependence of $A(z)$, c) the mean heat flux

$$Q(z_o) = \bar{T}^s A(z_o) \frac{\partial T(z_o)}{\partial z} = \varkappa(z_o) \frac{\partial \bar{T}(z_o)}{\partial z}$$

through the upper boundary, and d) the mean temperature at the lower boundary, $T(z_o')$. Fig. 1 shows results of a numerical computation of temperature distributions for different fluxes F (given in ergs/cm^{2}sec) and $\bar{P} = P_{DK}$, as well as $\bar{P} = P_{RK}/2$. P_{DK} denotes the P value according to F. Johnson (Temperature in the high atmosphere, Ann. Geoph., 14, 1, 1958). In $F(z_o) = \varkappa(z_o) \frac{\partial T(z_o)}{\partial z}$, the nature of the energy flux is still unclarified, but according to data obtained from sputniks and rockets it may be due to corpuscular radiation belts. The F values in Fig. 1 were chosen according to data by S. N. Vernov et al. (DAN, 130, 3, 517, 1960)

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Calculations of temperature...

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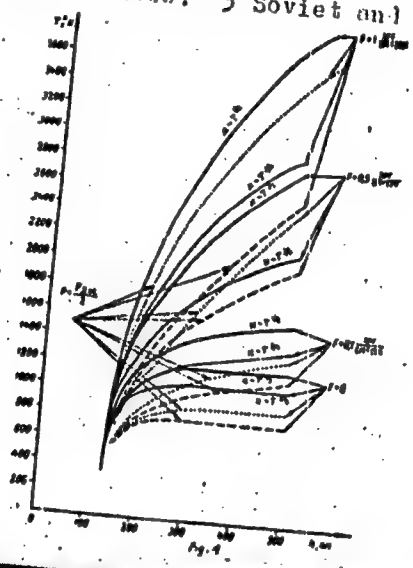
on the energy groups of electrons in the terrestrial radiation belt. There are 5 figures and 6 references: 3 Soviet and 3 non-Soviet.



Card 4/4

KONDRAT'YEV, Kirill Yakovlevich; FILIPOVICH, O.P., otv. red.; YASNOGORODSKAYA, M.M., red.; BRAYNINA, M.I., tekhn. red.

[Meteorological research by means of rockets and artificial satellites] Meteorologicheskie issledovaniia s pomoshch'iu raket i sputnikov. Leningrad, Gidrometeor. izd-vo, 1962. 251 p. (MIRA 15:6)

(Rockets in meteorology)
(Artificial satellites in meteorology)

37911
S/054/62/000/002/007/012
B163/B138

3,5110

AUTHOR: Filipovich, O. P.

TITLE: Height distribution of temperature in the thermosphere

PERIODICAL: Leningrad. Universitet. Vestnik. Seriya fiziki i khimii, no. 2, 1962, 78-93

TEXT: The temperature distribution in the thermosphere (i.e. at heights over 100 km) can be determined theoretically from the generalized heat conduction equation (O.P. Filipovich, Vestnik LGU, no. 16, 1961) and from experimental data collected by satellites on atmospheric density, using the equation of statics $dp = -\rho g dz$ and the ideal gas equation $p = nkT$. The second method is described, discussed in detail, and applied to various models of the upper atmosphere. The results are affected by the assumptions made concerning the dependence of the partial concentrations of the gas components on height. From an analysis of the results it is concluded that the main heat source of the thermosphere is the radiation energy from the sun which is absorbed by photoionization and photodissociation. A slow temperature rise with increasing height beyond 300 km

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YURLOV, N.M.; ZABOROVSKIY, T.P.; FILIPOVICH, P.I.; GRECHKIN, N.S.

Rapid execution of development workings at the No. 1/2 mine of the Sakhalinugol' combine. Ugol' 40 no.8:20-22 Ag '65. (MIRA 18:8)

FILIPOVICH, S.I.

Stand for fatigue tests of real gear wheels of traction transmissions of a locomotive. Nauch. zap. Od. politekh. inst. 39: 40-43 '61
(MIRA 17:3)

ZABLONSKIY, K.I., kand.tekhn.nauk, dotsent; BELYAYEV, M.S., kand.tekhn.nauk; FILIPOVICH, S.I., inzh.

Operating a herringbone reducing gear. Vest. mash. 41 no. 5:33-37 My '61. (MIRA 14:5)

(Gearing, Spiral)

S/124/63/000/002/038/052
D234/D303

AUTHORS: Zablonskiy, K.I., Filipovich, S.I. and Frenkel', I.N.

TITLE: Methods of determining stresses and deformations in tooth models

PERIODICAL: Referativnyy zhurnal, Mekhanika, no. 2, 1963, 59, abstract 2V473 (Nauchn. zap. Odessk. politekhn. in-t, 1961, v. 39, 44-49)

TEXT: The authors describe methods of determining stresses in the tooth bases of gear wheels with M.L. Novikov's toothing, on models made of organic glass (modulus 30 mm, tooth inclination angle $9^{o}.5$). The load was applied at different points of the tooth height and at three points along the length of the tooth (at the ends and in the middle). The displacement of contact towards the top of the tooth decreases the stresses on the side of extension and increases them on the side of compression. The friction forces appearing in the contact zone can lead to stresses amounting to 20% of the total stress. A decrease in the effect of the friction forces was achiev-

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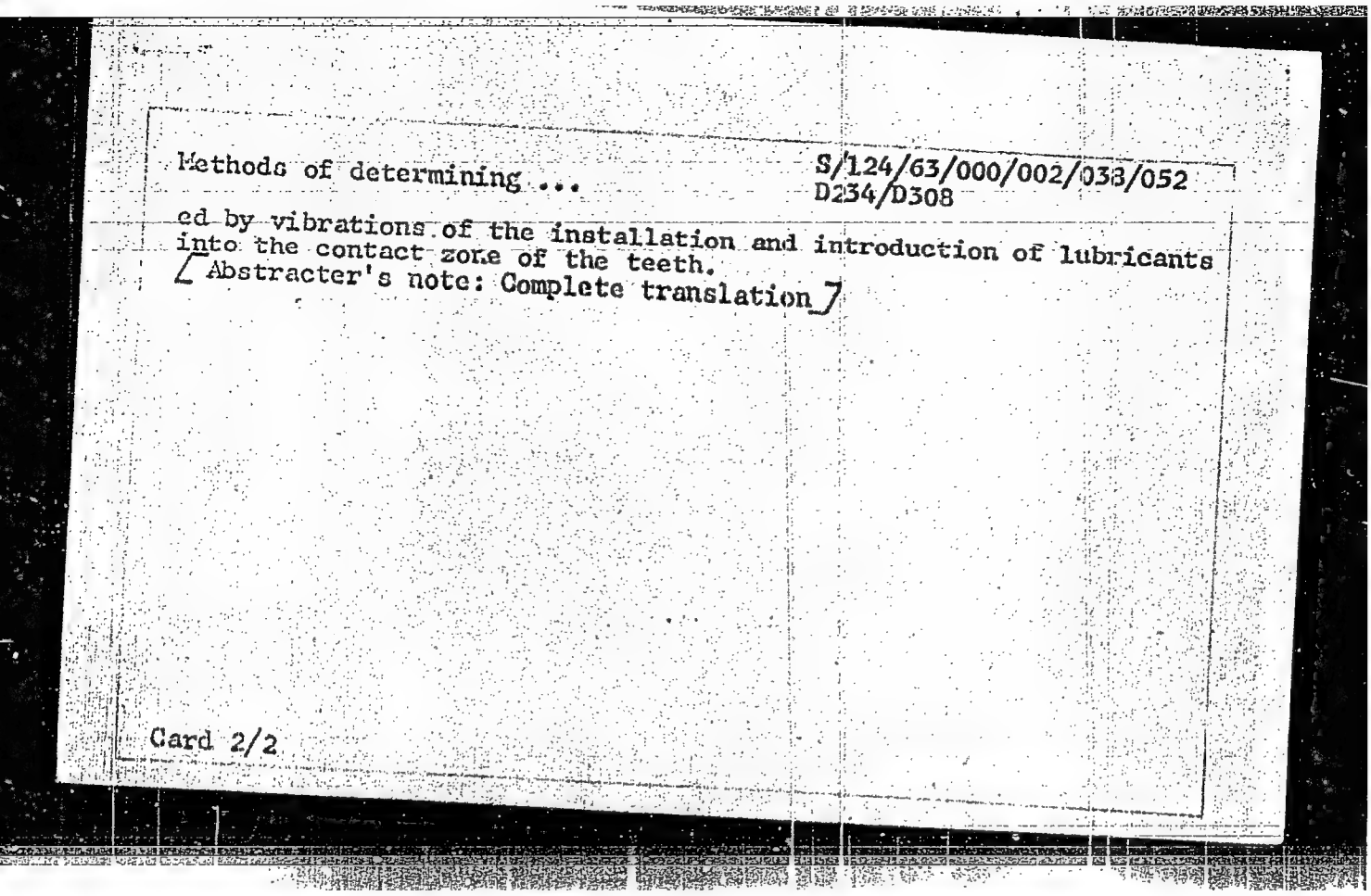

Methods of determining ... S/124/63/000/002/033/052
D234/D308

ed by vibrations of the installation and introduction of lubricants into the contact zone of the teeth.
[Abstracter's note: Complete translation]

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ZABLONSKIY, K.I., prof.; ZOBNIN, N.P., doktor tekhn. nauk, prof.; YUDIN, D.L., kand. tekhn. nauk, dotsent; FILIPOVICH, S.I., inzh.; PORKHACHEV, M.A., inzh.

Stands for hardening treatment and strength testing of the traction transmission gearing of locomotives. Trudy MIIT no.159:75-88 '62. (MIRA 16:6)

(Locomotives—Transmission devices)

ZABLONSKIY, K.I., prof.; YUDIN, D.L., kand.tekhn.nauk, dotsent; FILIPOVICH, S.I., inzh.

Methodology for the fatigue strength testing of the teeth of diesel locomotive gear wheels on a special stand. Trudy MIIT no.200:54-65 '64. (MIRA 18:8)

FILIPOVICH, S. M.

USSR/Medicine, Veterinary - Foot-and-Mouth Disease Aug 52

"Variations of The Virus in Foot-and-Mouth Disease," V. I. Kindyakov, A. N. Bayadinov, S. M. Filipovich, O. S. Nikonova, Sci Res Vet Inst, Kazakh Affilitte, All-Union Acad of Agr Sci imeni V. I. Lenin

"Veterinariya" No 8, pp 21-27

Discusses the variations in types of the virus causing foot-and-mouth disease. Lists 45 strains, classified according to types O, A, and C. On the basis of expts, assumes that there is only one parent virus with the ability of changing its "bioimmunological" properties under the influence of out side factors. States that the major factor in causing changes is the passage of the virus through the living organism of an animal with an acquired immunity to the disease. Authors recommend that herds of cattle that have recovered from the foot-and-mouth disease should be kept apart from cattle in the acute stages of the disease and that in research and treatment of foot-mouth- disease consideration should be given to possible changes in the manifestation of this virus. Recommend further research on the biol properties of the virus.

PA 233T11

FILIPOVICH, V.N.

Investigation of the structure of some silica gels by the method of small-angle scattering of x-rays. E. A. Poral-Koshits, A. M. Kulinina, and V. N. Filipovich. *Doklady Akad. Nauk S.S.S.R.* 86, 985-8(1952); cf. Augul, *et al.*, *C.A.* 45, 4095*f*, 5483*g*.—The small-angle scattering method was applied to 3 samples previously studied by the vapor-adsorption method: (I) homogeneously porous with a mean pore radius of 40 A., (II) homogeneously coarse-porous with a most probable effective pore radius of 100 A., and (III) inhomogeneously porous with the pore radius varying from about 15 to 150 A. The scattering angle φ varied from 6.5′ to 2°30′. Plots of log I (scattered intensity) as a function of φ^2 are linear for I and II, in accord with their monodispersity, and nonlinear for the polydisperse III. Calcn. of the vols. of pores of radius R, by the tangent method (*C.A.* 44, 7648*h*), gave the vol. distributions (%): I, 30 A. (87.5%), 55 (10), 87 (2.5); II, 55 A. (78%), 88 (14), 110 (8); III, 52.5 A. (32%), 126 (27), 240 (41). This gives a mean R, for I 34 A. (as against 40 A. by adsorption), and for II 64 A. (as against 100 A.). The agreement is good for I and acceptable for II. This agreement proves a posteriori that the small-angle scattering method has given the size distribution of the pores and not of the particles, at least in the case of I and III. This conclusion is less certain with respect to II. Numerical estn. of the accuracy of the x-ray detn. of R gives, for the 1st (min.) R an error of ~3 A., i.e. about 5%. N. Thon

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Filipovich, V.N.

USSR/ Chemistry - Silicates

Card 1/1 Pub. 40 - 4/27

Authors : Poray-Koshits, Ye. A., and Filipovich, V. N.

Title : The Babine principle and small angle x-ray diffusion with porous glass

Periodical : Izv. AN SSSR. Otd. khim. nauk 1, 21-30, Jan-Feb 1955

Abstract : The accuracy of the Babine principle and its applicability to small angle x-ray diffusion are discussed. The diffusion intensities of samples with "direct" and "reverse" structures were found to coincide with the accuracy of members determining zero diffusion. The diffraction chart is not recommended as a basis for the selection between the two structures. Nine references: 5 USSR, 1 English and 3 French (1945-1953). Tables; graphs; illustration.

Institution : Acad. of Sc., USSR, Inst. of Chem. of Silicates

Submitted : June 30, 1954

Filipovich, V.N.

Category : USSR/Solid State Physics - Structural Crystallography E-3

Abs Jour : Ref Zhur - Fizika, No 2, 1957 No 3681

Author : Filipovich, V.N.
Title : Concerning the Theory of Scattering of X-rays in Gases, Liquids, Amorphous Solids, and Polycrystals

Orig Pub : Zh. tekhn. fiziki, 1955, 25, No 9, 1604-1621

Abstract : The intensity of scattering from the investigated objects is given by the equation

$$I(s) = 4\pi \int_0^\infty \varphi(r)\, r^2 \frac{\sin sr}{sr}\, dr \qquad (1)$$

where

$$\varphi(r) = \int \rho(\vec{r}', t)\,\rho(\vec{r}' + \vec{r}, t)\, dr' \equiv \sum_{j=1}^{m} N_j Z_j \rho_j(r)$$

is the sum of the average radial distributions (averaged over the atoms of each kind and over the time) of the electron density around the centers of the atoms of a given sort, multiplied by $N_j Z_j$ -- the total number of electrons in these atoms. Inversion of the Fourier integral (1) makes it possible to find φ experimentally, using known methods. Using

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Category : USSR/Solid State Physics - Structural Crystallography E-3

Abs Jour : Ref Zhur - Fizika, No 2, 1957 No 3681

the Fourier method, the author analyzes the effect of the fact that I (s) is experimentally unknown at $s \simeq 0$ and $s \geq 4\pi/\lambda$. The first of these circumstances is eliminated by taking into account the "zero" scattering I_0 by the average electron density, while the second makes it possible to obtain $\rho(r)$ only approximately, and may result in false details. Introducing the atomic factors and eliminating the gas scattering, the author obtains next the well known equation for radial distribution in liquids and amorphous bodies, given by Warren and his associates for the atom-electron density ρ'_{ae}. The maxima of the latter agree most accurately with the interatomic distances. A specific example is used to show that a supplementary source of possible errors is the usually-employed method of normalization of the intensity curve over the distant regions s, where this curve may fluctuate. False maxima may be identified by the equal distances between them (amounting to $\Delta r \simeq 2\pi/s_0$) and by the fact that the amplitude diminishes as $1/r^2$.

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Filipovich, V.N.

Category : USSR/Solid State Physics - Structural Crystallography E-3

Abs Jour : Ref Zhur - Fizika, No 2, 1957 No 3682

Author : Filipovich, V.N.
Title : Concerning the Theory of Scattering the X-rays in Gases, Liquids, Amorphous Solids and Polycrystals. II.

Orig Pub : Zh. tekhn. fiziki, 1955, 25, No 9, 1622-1638

Abstract : Fourier analysis is used to examine the broadening the diffraction lines of X-ray photographs of polycrystalline objects as functions of the dimensions of th crystals and of certain defects in their lattice. The author obtains in this manner a somewhat refined form of the Bertaut equation (Bertaut, E.F., Acta crystallogr., 1950, 3, 14) and the Stokes and Wilson equation (see Wilson, A., Optics of X-rays, IL, 1950). The sources of errors are indicated and the methods for estimating the errors are given for the calculation of the average characteristic magnitude L_K of the minute crystals in the specimen.

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FILIPOVICH, V. N.

Category : USSR/Solid State Physics - Structural crystallography E-3

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1059

Author : Filipovich. V.N., Poray-Koshits, Ye.A.,
Inst : Inst. of Chemistry of Silicates, USSR Academy of Sciences
Title : On the Theory of Scattering of X-rays by Macroscopic Isotropic Bodies

Orig Pub : Dokl. AN SSSR, 1955, 105, No 5, 968-971

Abstract : A new derivation is given for the equations of the Fourier analysis of curves for scattering by macro-isotropic (liquid, amorphous, and polycrystalline) bodies. It is shown that such an analysis gives a structural characteristic of the substance in the form of a function

$$\varphi(r) = \int \rho(r', t)\rho(r'+r, t)\, dv';$$

where $\varphi(r,t)$ is the instantaneous distribution of the electron density in the specimen, and the bar indicates averaging over the time of the x-ray exposure. For macro-isotropic bodies, $\varphi(r)$ depends only on $|r| = r$ and is determined by the equation

$$\varphi(r) = 1/2\pi^{(2)} r \int_0^\infty sI(s)\sin rs\, ds$$

where I(s) is the scatterin intensity ($s = 4\pi \sin \theta/\lambda$; 2θ is the scattering

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Category : USSR/Solid State Physics - Structural crystallography E-3

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1059

angle). Since I(s) cannot be determined experimentally at $s = 0$ and at $s > 4\pi/\lambda$, the only thing that can be found in practice is the function $\Delta\varphi_1 = \varphi_1(r) - \bar{\varphi}_1(r)$ (Babinet's principle), where

$$r\Delta\varphi_1(r) = 1/\pi \int_{-\infty}^{+\infty} t\,\Delta\varphi(t)\,[\sin s_1(r-t)/(r-t)]\cdot dt,$$

is the average value of (r) ((r) is approximately constant at small values of r). Analogous equations can be obtained if one introduces the atomic factors $f_j(s)$ and correspondingly the function of distribution density of "point" atoms $\rho_{\alpha\beta}(r)$. This makes it necessary to calculate very accurately the "gas scattering" $I_g(s) = \sum N_j f_j(s)$ (summed over all types of atoms) from I (s), for otherwise the radial-distribution curve (the analogue of (r)) will contain false details, which may occur in addition also as a result of calculating $\Delta\varphi_1(r)$ rather than $\Delta\varphi(r)$. False maxima apparently occured in the work by Richter and his associates. (Referat. Zhurnal Fizika, 1955, 11557).

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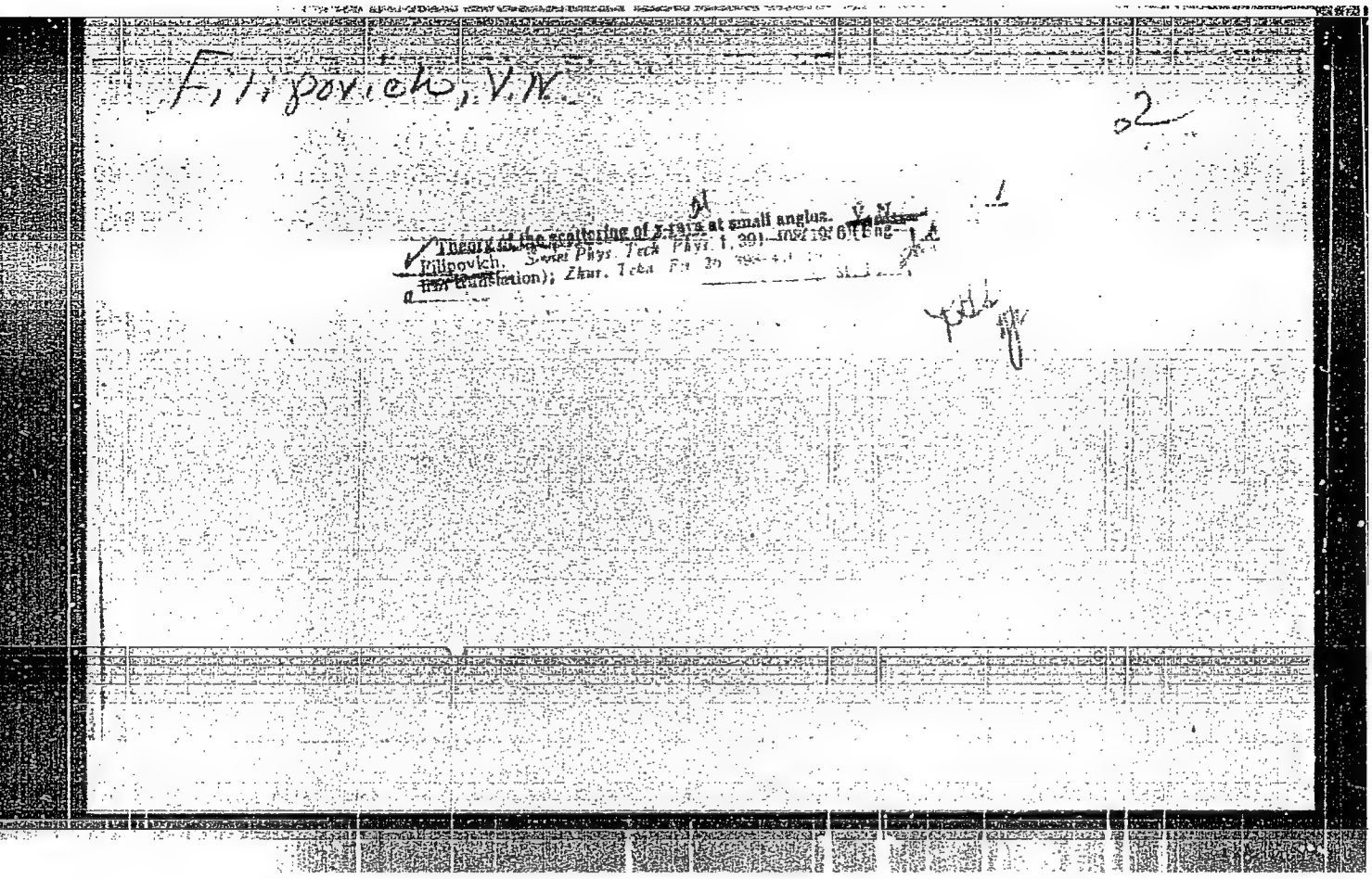

FILIPOVICH, V.N.

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The calculation of interatomic distances by using th

24

Filipovich, V.N.

USSR/ Physical Chemistry - Crystals B-5

Abs Jour : Referat Zhur - Khimiya, No 3, 1957, 7241

Author : Filipovich, V.N.
Title : On the Theory of Low-Angle Scattering of X-rays

Orig Pyb : Zh. tekhn. fiziki, 1956, Vol 26, No 2, 398-416

Abstract : A previously described method (RZhKhim, 1956, 74171) is used in the elaboration of a theory of low-angle scattering (LASC). The Fourier series obtained are analogous to previously obtained results (G. Porod, Kolloid Z., 1951, 121, 2) for bodies giving isotropic LASC. Typical examples of LASC are discussed as well as the accuracy of the calculation of the radial distribution curve and a number of other characteristic parameters (diameter, surface, and volume of the scattering heterogeneities) from the experimental data.

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Filipovich V.N.

USSR / Solid State Physics / Structural Crystallography E-4

Abs Jour : Ref Zhur - Fizika, No. 6, 1957 No. 11683.

Author : Filipovich, V. N.
Inst : -
Title : Contribution to the Theory of Scattering of X-rays at Small Angles.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 2, 398 - 416.

Abstract : A theoretical work, serving as a continuation of preceding work (Referat Zhur Fizika, 1957, 3681, 3682) and which is a generalization and refinement of the corresponding theory by Porod (Porod, G., Kolloid Z, 1957, 124, 2). It is explained that failure to take into account the zero scattering and scattering at small angles, due to the presence in the specimen of submicroscopic irregularities of the structure measuring more than 10 --20 A, leads to a loss of corresponding information on the structure of the

Card: 1/2

Filipovich, V.N.

USSR / Solid State Physics / Structural Crystallography E-4

Abs Jour : Ref Zhur - Fizika, No. 5, 1957 No. 11588.
Author : Filipovich, V.N.
Title : Determination of Interatomic Distances from the Radial-Distribution Curves.

Orig Pub : Zh. tekhn. fiziki, 1956, 26, No 2, 417 - 421.

Abstract : Continuation of previous works (Referat Zhur Fizika, 1957, 3681, 3682) pertaining to the theory of scattering of X-rays by macroisotropic bodies. A premise is examined in detail and proven, that is practice the interatomic distances must be determined always from the curve $r\varphi'(r)$ and not from the curves $\varphi'(r)$ or $r^2\varphi'(r)$ (φ' is the interatomic-distance density function). Also considered is the problem of the possibility that the dimensions of the minute crystals affect the interatomic distances, determined from the radial-distribution curve.

Card: 1/1

AUTHOR: FILIPOVICH,V.N. PA - 3557

TITLE: Collimation Correction to Low-Angle X-Ray Scattering. (O kollimatsionnoy popravke v teorii rasseyaniya rentgenovskikh luchey pod malymi uglami, Russian)

PERIODICAL: Zhurnal Tekhn. Fiz. 1957, Vol 27, Nr 5, pp 1029-1044 (U.S.S.R.)

ABSTRACT: A detailed description of the tasks of collimation correction is given. The method already described and applied in previous papers (Zhurnal Tekhn.Fiz. 1956, Vol 26, Nr 2; 1955, Vol 25, p 1604; 1955, Vol 25, p 1622) is employed. The methods employed for practical collimation correction are systemized and further developed. The complete solution is given of a problem concerning a rectangular gap and a homogeneously impining bundle, and a simplified method of carrying out the correction to this case is suggested.

In a general form some collimation effects are investigated, viz. the shifting of the interference maximum in the case of an increase of the length of the gap in the direction of the smaller angles, and the possibility of the vanishing of this maximum in the case of an increase of the width of the gap. (With 5 Illustrations and 6 Slavic References).

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PA - 3557

Collimation Correction to Low-Angle X-Ray Scattering.

ASSOCIATION: Institute for the Chemistry of Silicates of the Academy of Science of the U.S.S.R., Leningrad

PRESENTED BY:

SUBMITTED: 14.1.1957

AVAILABLE: Library of Congress

Card 2/2

24.7200

67186

SOV/58-59-7-15368

Translation from: Referativnyy Zhurnal Fizika, 1959, Nr 7, p 109 (USSR)

AUTHORS: Poray-Koshits, Ye.A., Filipovich, V.N.

TITLE: Some New Possibilities of the Small-Angle X-Ray Scattering Method

PERIODICAL: V sb.: Metody issled. struktury vysokodispersn. i poristykh tel. Moscow, AS USSR, 1958, pp 7 - 18

ABSTRACT: To extend the possibilities of the X-ray method of small-angle scattering (SAS), the authors propose that a new experimental technique be adopted, using a frame camera, a single-crystal monochromator with point focusing of the primary beam, and various variants of an ionization device with two single crystals. It follows from present-day SAS theory that one can use the formula of Fourier analysis to obtain a number of new parameters in addition to the radii of inertia. The comparison of these parameters, together with the simultaneous use of the direct results of Fourier analysis, permits a more complete and unambiguous analysis of the structure of the scattering regions of inhomogeneity and, in particular, the determination of their inner surface per unit mass of the sample. (In-t khimii silikatov).

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The authors' résumé

FILIPOVICH, V.N.

24(6) PHASE I BOOK EXPLOITATION SOV/1408

Soveshchaniye po metodam issledovaniya struktury vysokodispersnykh i poristykh tel. 2d, Leningrad, 1956.

Metody issledovaniya struktury vysokodispersnykh i poristykh tel; trudy vtorogo soveshchaniya (Methods of Investigating the Structure of Highly Disperse and Porous Bodies; Transactions of the Second Conference) Moscow, Izd-vo AN SSSR, 1958. 294 p. 2,000 copies printed.

Sponsoring Agencies: Akademiya nauk SSSR. Institut fizicheskoy khimii and Institut khimii silikatov.

Resp. Ed.: Dubinin, M.M., Academician; Ed. of Publishing House: Razumova, L.L.; Tech. Ed.: Markovich, S.M.

PURPOSE: This book is intended for scientists, teachers and advanced students interested in the structural analysis of highly disperse and porous bodies.

COVERAGE: This collection contains reports by members of various Soviet institutions of higher education: Institute of Physical Chemistry, AS UkrSSR;

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Institute of Chemistry, AS Georgian SSR; Far Eastern Branch, AS USSR; Georgian Scientific Research Institute for Petroleum; State Optical Institute; Leningrad Technological Institute; Moscow and Leningrad State Universities; Far Eastern Polytechnic Institute; "Agrophysical" Institute, and others. Introductory remarks were made by Professor N.A. Toropov, Director of the Institute of Silicate Chemistry. Apart from reports under the four subject divisions (see Table of Contents), the collection includes discussions, considerations and proposals adopted at the close of the conference.

TABLE OF CONTENTS:

APPROVED FOR RELEASE: 06/13/2000 CIA-RDP86-00513R000413110011-9"

Methods of Investigating the Structure of Highly (Cont.) SOV/1408

PART V. GENERAL DISCUSSION

AVAILABLE: Library of Congress

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4-29-59

Card 9/9

SOV/81-59-15-53229

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 15, p 138 (USSR)

AUTHORS: Poray-Koshits, Ye.A., Filipovich, V.N.

TITLE: Some New Possibilities of the Method of X-Ray Scattering at Small Angles

PERIODICAL: V sb.: Metody issled. struktury vysokodispersn. i poristykh tel. Moscow, AN SSSR, 1958, pp 7-18

ABSTRACT: A short description of a new experimental work on the method of X-ray scattering under small angles (SSA) of the following devices: a) a frame camera; b) point focusing of a bunch by a monochromator made of a quartz crystal with barrel-shaped curved planes; c) a double crystal-spectrometer with recording by a counter. Some principal aspects of the theory of SSA are considered. The connection of the functions of radial distribution with the intensity of the diffraction picture is shown. The corresponding pictures for six types of submicroscopic structure are given. It has been shown that the Fourier analysis by SSA permits to understand the structure of the scattered non-homogeneities.

M. Umanskiy

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FILIPOVICH, V. N.

AUTHORS: Sinel'nikov, N. N., Filipovich, V. N., 57-1-29/30

TITLE: Adiabatic Calorimeter - an Instrument for Simultaneous Determination of Specific Heat and Heat Conductivity (Adiabaticheskiy kalorimetr - pribor dlya odnovremennogo opredeleniya teployemkosti i teploprovodnosti)

PERIODICAL: Zhurnal Tekhnicheskoy Fiziki, 1958, Vol. 28, Nr 1, pp. 218-221 (USSR)

ABSTRACT: The description of the calorimeter was given by the author already in ref.1. By means of this calorimeter the actual specific heat c of the material and its heat conductivity λ and therefore also temperature conductivity a can be determined simultaneously. The calorimeter is surrounded by a concentrically located preheater, which consists of a thin nickel band forming an adiabetic shell around the sample. The inner preheater, consisting of a molybdenum wire, is located along the axis of the cylinder. Thus, the construction of the calorimeter, from the point of view of temperature distribution on the sample practically corresponds to an infinite cylinder. The experiment for the determination of the actual specific heat consists in ceding thermostating (maintenance of uniform temperature) of the sample, supply of a certain amount of heat by means of the inner preheater and temperature

Card 1/3

measuring of the sample after the restoration of thermal equilibrium. The feeding of the inner preheater is chosen in a way that in the course of the whole process of preheating the radiation strength of the wire remains constant. Thus, the temprature of the shell will remain equal to that of the periphery of the sample during the time of the experiment. The measuring of heat conductivity which is made simultaneously with the measuring of specific heat is based on the properties of the nonsteady temperature field of the problem investigated. A formula for λ is derived by means of which heat conductivity cyn be determined in the case that the quantity of the heat flow and the temperature increase at the outer surface of the sample from the beginning of the feeding of the preheater until the establishement of the equilibrium state is known. On the other hand, since the total heat Q with which the sample was fed, and the total temperature increase of the sample $\Delta t = \Delta t_1 + \Delta t_2$ were determined the specific heat $c = Q/\Delta t$ can be computed. Measuring results for the heat conductivity coefficient of powderous quartz at normal atmospheric pressure and at remnant pressures of an approximately o,5 and $5 \cdot 10^{-5}$ mm mercury column are given. In the first case heat trans-

Adiabatic Calorimeter - an Instrument for Simultaneous Determination of Specific Heat and Heat Conductivity. 57-1-29/30

fer occurs at the cost of air convection, of heat conductivity of the air, at the cost of the heat conductivity of quartz itself and of heat transfer due to radiation. In the second case air participates in heat exchange, air convection, however, practically lacks. Heat transfer is due to radiation as well as to heat conductivity of the air and of quartz. In the latter case the air practically does not participate in heat exchange and heat transfer occurs only at the cost of radiationand of heat conductivity of quartz. Conclusively it is stated that with the rise of temperature the rôle of heat transfer due to convection decrease at the cost of an increase of the rôle of radiation. There are 4 figures, and 1 Slavic reference.

ASSOCIATION: Institute for Silicate Chemistry AN USSR Leningrad (Institut khimii silikatov AN SSSR Leningrad)

SUBMITTED: July 13, 1956

AVAILABLE: Library of Congress

Card 3/3

24(6)

AUTHOR: Filipovich, V. N.

SOV/57-58-12-12/15

TITLES: On the Theory of X-Ray Scattering by Distorted Crystals (K teorii rasseyaniya rentgenovskikh luchey iskazhennymi kristallami)
I. Theory Without Atom Coefficients (I. Teoriya bez atomnykh faktorov)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, Nr 12, pp 2716-2726 (USSR)

ABSTRACT: The present paper is a continuation of the papers cited in references 1 and 2 and was written in the course of an attempt to apply the method of Fourier (Fur'ye) analysis, which has been employed already before, to the problem of x-ray scattering in distorted crystals. The application of the theory of Fourier expansion allows to obtain simple and clear general formulae and to relate the theories of x-ray scattering in distorted crystals suggested by various authors. The paper consists of two parts. In the first part the general theory of scattering in crystals containing internal cavities, cracks, and deformations is presented on the basis of a direct expansion of the electron density into a Fourier series without introducing atom coefficients. In the second part the same

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On the Theory of X-Ray Scattering by Distorted Crystals. I. Theory Without Atom Coefficients

SOV/57-58-12-12/15

theory is shown but with atom coefficients and an indirect application of the methods of Fourier analysis. This theory is more exact with regard to a description of the effects caused by a shift of the atoms from the ideal positions as compared to the theory without atom coefficients. The latter one, however, has a less complex structure and permits to employ the methods of Fourier analysis of diffusion scattering to a much wider extent. There exist simple rules for the transition between the two variants of the theory. There are 2 figures and 6 references, 5 of which are Soviet.

ASSOCIATION: Institut khimii silikatov AN SSSR Leningrad (Institute of Silicate Chemistry, AS USSR, Leningrad)

SUBMITTED: August 30, 1958

Card 2/2

24(6)

AUTHOR: Filipovich, V. N.

SOV/57-58-12-13/15

TITLE: On the Theory of X-Ray Scattering by Distorted Crystals (K teorii rasseyaniya rentgenovskikh luchey iskazhennymi kristallami)
II. The Theory Containing Atom Coefficients (II. Teoriya s atomnymi faktorami)

PERIODICAL: Zhurnal tekhnicheskoy fiziki, 1958, V 28 Nr 12, pp 2727-2738 (USSR)

ABSTRACT: On the basis of the application of Fourier (Fur'ye) expansions (Ref 11) in the present paper a general kinematic theory of diffusion scattering in distorted crystals is constructed. Two variants of the theory are presented: With and without application of atom coefficients. The first variant is more convenient for using a Fourier analysis. The second variant is more accurate and is applicable in a wide range. There are simple rules for the transition between these two variants. From the viewpoint of the theory of diffusion scattering developed in the present case the relation between the theories of various authors of this problem as well as the range of application and the accuracy of these theories may be determined without difficulty. From the present and previous papers (Ref 11) may

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On the Theory of X-Ray Scattering by Distorted Crystals. II. The Theory Containing Atom Coefficients

SOV/57-58-12-13/15

be deduced that the whole Fraunhofer optics of x-rays can be established rationally and exactly on the basis of a Fourier analysis. The theory obtained in this instance exhibits the character of a consistent theory of x-ray scattering by a body of arbitrary nature. There are 11 references, 1 of which is Soviet.

ASSOCIATION: Institut khimii silikatov AN SSSR Leningrad (Institute of Silicate Chemistry, AS USSR, Leningrad)

SUBMITTED: August 30, 1958

Card 2/2

FILIPOVICH, V. N., Candidate Phys-Math Sci (diss) -- "The kinematic theory of propagation of X-rays by macroscopically isotropic bodies". Leningrad, 1959. 16 pp (Leningrad Order of Lenin State U im A. A. Zhdanov), 150 copies (KL, No 22, 1959, 108)

FILIPOVICH, V.N.

Theory of X-ray scattering in distorted polycrystals consisting of three-dimensional crystals. Fiz. tver. tela 3 no.6:1694-1701 Je '61. (MIRA 14:7)

1. Institut khimii silikatov AN SSSR, Leningrad.
(X Rays--Scattering) (Dislocations in crystals)

S/181/62/004/011/027/049
B125/B186

AUTHOR: Filipovich, V. N.

TITLE: Theory of X-ray scattering by oriented polymers and other systems with axial macroscopic isotropy

PERIODICAL: Fizika tverdogo tela, v. 4, no. 11, 1962, 3244-3253

TEXT: This is a continuation of the author's previous studies made on the same subject (V. N. Filipovich. ZhTF, 25, no. 14, 1955; FTT, 3, 1961). Two variants of a general theory of Fourier analysis of X-ray patterns are considered, without and with atomic factors introduced. The formula for the intensity of the coherent scattering of X-rays by a given macro-isotropic body of axial symmetry and the reversal of the Fourier integral may be written in the form

$$I(\rho, z_1) = 2\pi \int_0^\infty \int_{-\infty}^{\infty} \rho\varphi(\rho, z) J_0(\rho\rho) e^{i(z_0 - z_1)} d\rho dz, \quad (5),$$

$$\varphi(\rho, z) = \frac{1}{(2\pi)^2} \int_0^\infty \int_{-\infty}^{\infty} \rho I(\rho, z_1) J_0(\rho\rho) e^{-i(z_0 - z_1)} d\rho dz_1, \quad (6),$$

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Theory of X-ray scattering by...

$$J_0(\rho p)=\frac{1}{2\pi}\int_0^{2\pi} e^{i\rho p\cos\alpha}\,d\alpha \qquad (7)$$

after having substituted $\vec{r}$ by $\vec{r} = \vec{\varrho} + \vec{z}$, and subsequent integration over α. $J_0(\varrho p)$ is a Bessel function of zeroth order, $\varrho(\vec{r})$ is the electron density, and $\vec{s} = \vec{s}_1 - \vec{s}_0$, $|\vec{s}_0| = 2\pi/\lambda$. $\vec{s}_0$ is directed along the incident beam and s_1 lies in the direction of observation. $\varphi(\vec{r})$ may be considered a Patterson function for the whole body. In view of the cumbersome procedure involved in complete analysis only two particular solutions to the problem are given. If $s_z = 0$, i.e. if there is an "equator" in the diffraction image,

$$I(p, 0)=2\pi\int_0^{\infty}\rho\varphi_z(\rho)J_0(\rho p)\,d\rho, \qquad (9),$$

$$\varphi_z(\rho)=\frac{1}{2\pi}\int_0^{\infty} pI(p, 0)J_0(\rho p)\,dp, \qquad (10),$$

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$$\varphi_z(\rho) = \int_{-\infty}^{\infty} \varphi(\rho, z)\,dz = 2\int_{0}^{\infty} \varphi(\rho, z)\,dz. \qquad (11).$$

φ_z is the projection of $\varphi(\vec{r})$ onto the plane which is normal to the axis z of symmetry. If the packing distances between the atoms and molecules are known it is possible to reach conclusions as to the character of the packing and to make a mean estimate as to the shape of the cross-section of the molecules. That part of $\varphi(\vec{r})$ which characterizes the zero scattering may be separated by putting the electron density $\varrho(\vec{r}) = \bar{\varrho}\ (\vec{r}) + \gamma\varrho(\vec{r})$. $\gamma(\vec{r})$ is the form function of the specimen, and $\bar{\varrho}$ is its mean electron density. When introducing the atomic scattering factors $f_j(s) = \int \varrho_j(\vec{r}) e^{i(\vec{s}\vec{r})}\,dv$ into the intensity formula, then ϱ can be written as the sum of atomic electron densities. By introducing these factors into (5) and (6) for bodies with axial macrosymmetry the equations

Theory of X-ray scattering by...

$$\frac{I(\rho, s_z)-I_r\left(\sqrt{\rho^2+s_z^2}\right)}{f_e^2\left(\sqrt{\rho^2+s_z^2}\right)}=2\pi\int_0^\infty\int_{-\infty}^{\infty}\rho\varphi'_{ae}(\rho, z)J_0(\rho\rho)e^{i(s_z z)}dzd\rho, \quad (39)$$

and

$$\varphi'_{ae}(\rho, z)=\frac{1}{(2\pi)^2}\int_0^\infty\int_{-\infty}^{\infty}\rho\frac{I-I_r}{f_e^2}J_0(\rho\rho)e^{-i(s_z z)}ds_z d\rho \quad (40)$$

are obtained. The functions φ'_{ae} show more pointed maxima than the functions φ and exhibit also some "false" diffraction maxima. There are 3 figures.

ASSOCIATION: Institut khimii silikatov im. I. V. Grebenshchikova AN SSSR, Leningrad (Institute of the Chemistry of Silicates imeni I. V. Grebenshchikov AS USSR, Leningrad)

SUBMITTED: June 26, 1962

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FILIPOVICH, V.N.

Theory of X-ray scattering in distorted polycrystals composed of unidimensional minute crystals. Fiz.tver.tela 3 no.7:1920-1932 Jl '61. (MIRA 14:8)

1. Institut khimii silikatov AN SSSR, Leningrad.
(X rays--Scattering) (Dislocation in crystals)

BR

ACCESSION NR: AT4019277 S/0000/63/003/001/0009/0024

AUTHOR: Filipovich, V. N.

TITLE: Initial stages of glass crystallization and the formation of glass ceramics

SOURCE: Simpozium po stekloobraznomu sostoyaniyu. Leningrad, 1962. Stekloobraznoye sostoyaniye, vy*p, 1: Kataliziirovannaya kristallizatsiya stekla (Vitreous state, no. 1: Catalyzing crystallization of glass). Trudy* simpoziuma, v. 3, no. 1 Moscow, Izd-vo AN SSSR, 1963, 9-24

TOPIC TAGS: glass, glass crystallization, glass ceramic, catalyzed crystallization, liquation, vitrification, relaxation

ABSTRACT: Since newly formed glass is in an unstable state, the initial stages of glass formation must involve some type of relaxation process, i.e. the establishment of a stable or metastable equilibrium. Two types of relaxation process are usually encountered side by side: vitrification as seen in the process of metastable liquation, and crystallization, the relative importance of each type being determined by the composition of the glass. After discussing the two types of relaxation, the author presents a formula:

$$I = N^{\circ}N_1^{\circ} = \left(Ne^{-\frac{\Delta\omega}{kT}}\right)\left(Ae^{-\frac{\Delta\omega_A^{\circ}}{kT}}\right), \qquad (1)$$

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ACCESSION NR: AT4019277

for the rate of formation of the new phase and points out that this rate is maximal at a given temperature defined by:

$$T_m = \frac{T_0}{\delta}\left(1+\frac{\Delta\Phi_A^*}{\Delta\Phi^*}\right)\Big/\left(1+\frac{1}{\delta}\frac{\Delta\Phi_A^*}{\Delta\Phi^*}\right). \qquad (2)$$

He then points out that there are two possible mechanisms for the crystallization of a complex glass: with precrystallization liquation and without it, and discusses the nucleation of the new phase from the point of view of statistical thermodynamics, citing metastable liquation of the non-eutectic and eutectic types as examples. The value of $\Delta\Phi_V$ ($= \frac{4}{3}\pi r^3 (\Phi_C - \Phi_g)$ where r is the critical radius of the spherical nucleus and Φ_C and Φ_g are the thermodynamic potentials per unit volume of the crystal and glass, respectively) is calculated for several examples. In discussing the role of the nuclei of crystallization during the formation of glass ceramics, the author outlines the requirements resulting from the need for homogeneity and fine dispersion in the ceramic material, and discusses the rate and sequence of formation of new phases. Finally, the author discusses the three types of catalysis used to accomplish the crystallization of commercial glass ceramics and applies the general principles of statistical physics and

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ACCESSION NR: AT4019277

thermodynamics to the analysis of the high mechanical strength of such polycrystalline materials. Orig. art. has: 13 formulas and 5 figures.

ASSOCIATION: None

SUBMITTED: 17May63 DATE ACQ: 21Nov63 ENCL: 00

SUB CODE: MT, TD NO REF SOV: 011 OTHER: 002

Card 3/3

ACCESSION NR: AT4019285 S/0000/63/003/001/0053/0066

AUTHOR: Kalinina, A. M.; Filipovich, V. N.; Kolesova, V. A.; Bondar', I. A.

TITLE: Crystallization produces of lithium silicate glass

SOURCE: Simpozium po stekloobraznomu sostoyaniyu. Leningrad, 1962. Stekloobraznoye sostoyaniye, vy*p. 1: Katalizirovannaya kristallizatsiya stekla (Vitreous state, no. 1: Catalyzing crystallization of glass). Trudy* simpoziuma, v. 3, no.1. Moscow, Izd-vo AN SSSR, 1963, 53-66

TOPIC TAGS: glass, silicate, lithium, glass crystallization, spectroscopy, absorption spectrum

ABSTRACT: The crystallization of glass of the Li_2O-SiO_2 system was investigated and the succession of crystalline phases was found to depend on the composition of the crystallizing glass and its thermal treatment. Thermograms of glass are plotted and the problem of the existence of solid silica solutions in lithium disilicate in the crystallization products of glass of high silica content is discussed. The investigation was carried out by x-ray, thermographic and microscopic methods, as well as by means of infrared absorption spectra. Two kinds of samples were studied:

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ACCESSION NR: AT4019285

some were found to range from the eutectic composition (30 mol.% Li_2O) to pure SiO_2, and others were found to be of a composition ranging from metasilicate to disilicate (36-48 mol.% Li_2O). The temperatures of crystallization were 430, 480, 630, 900-960 C; time: 1-100 hours. Some samples were subjected to thermal treatment over a temperature range of 430-960 C. The appearance of the different crystalline structures (lithium disilicate, metasilicate, cristobalite, tridymite) in relation to the varying experimental conditions is discussed in detail. Orig. art. has: 7 figures and 1 table.

ASSOCIATION: None

SUBMITTED: 17May63 DATE ACQ: 21Nov63 ENCL: 00

SUB CODE: MT, OP NO REF SOV: 007 OTHER: 008

Card 2/2

TOROPOV, N.A.; RUMYANTSEV, P.F.; FILIPOVICH, V.N.

Kinetics of dissolution of CaO, 3CaO.SiO, 2CaO.SiO in the liquid phase of cement clinker. Zhur. fiz. khim. 38 no.4: 974-978 Ap '64. (MIRA 17:6)

1. Akademiya nauk SSSR i Leningradskiy institut khimii silikatov.

L 00474-66 EWP(e)/EPA(s)-2/EWT(m)/EWP(i)/EPA(w)-2/EWP(b) WW/GS/WH
ACCESSION NR: AT5013387 UR/0000/65/000/000/0015/0019

AUTHOR: Filipovich, V. N.

TITLE: Relationship between melt, glass, and pyroceramic structures

SOURCE: AN SSSR. Institut khimii silikatov. Strukturnyye prevrashcheniya v steklakh pri povyshennykh temperaturakh (Structural transformations in glass at high temperatures) Moscow, Izd-vo Nauka, 1965, 15-29

TOPIC TAGS: pyroceramic, glass crystallization, glass structure

ABSTRACT: A classification of melts and glasses is made on the basis of the nature of their crystallization, which either involves decomposition into two or more crystalline phases or takes place without it. The fluctuational structure of glass and the inhomogeneous phase structure associated with liquation processes in the glass are considered. The structure of glass is inhomogeneous, and is a function of the conditions of its cooling and thermal treatments. Modern concepts of the structure of complex glasses are discussed from this point of view. The physical content of relaxation processes by which a metastable and stable equilibrium is established in glass (vitrification and crystallization) are described in qualitative terms. The relationship between the inhomogeneous

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L 01474-66
ACCESSION NR: AT5013387

structure of glass, sequence of precipitation of the crystalline phases, and polycrystalline structure of the pyroceramic is examined. Emphasis is placed on the lack of a special precrystallization phase separation in glasses that differs from the customary metastable liquation, which is an independent phase transition in the vitreous state. Orig. art. has: 4 figures and 18 formulas.

ASSOCIATION: none

SUBMITTED: 21Dec64 ENCL: 00 SUB CODE: MT

NO REF SOV: 012 OTHER: 002

Card 2/2

L 00390-66 EWP(e)/EPA(s)-2/EWT(m)/EWP(i)/EPA(w)-2/EWP(b) WW/GS/WH
ACCESSION NR: AT5013388 UR/0000/65/000/000/0030/0043

AUTHOR: Filipovich, V. N.

TITLE: Crystallization of glasses during the formation of pyroceramics

SOURCE: AN SSSR. Institut khimii silikatov. Strukturnyye prevrashcheniya v steklakh pri povyshennykh temperaturakh (Structural transformations in glass at high temperatures). Moscow, Izd-vo Nauka, 1965, 30-43

TOPIC TAGS: pyroceramic, glass crystalization, glass property

ABSTRACT: The article presents a qualitative theory of the formation of pyroceramics in the course of crystallization of glass starting at low temperatures. The sequence of precipitation of the phases, the nature of the mechanical strength of pyroceramics, the process of formation of the pyroceramic, and the role of the chemical composition are discussed. In order to obtain high-quality pyroceramics, it is necessary to attain a high nucleation rate in the crystalline phase which precipitates first. This may be achieved by utilizing the liquation phenomenon or by using readily crystallizable impurities which are sparingly soluble in glass. If the subsequent heat treatment is carried out properly, a fine dispersion of the first phase automatically leads to a fine dispersion of

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L 00390-66

ACCESSION NR: AT5013388

the subsequent phases and to a high strength of the pyroceramic as a whole. All degrees of heat treatment should be chosen at the lowest possible temperatures, which, however, are combined with reasonable periods of heat treatment. This condition follows from the requirement that the crystal growth rate be optimally slow. The strength of the pyroceramics obtained is due to the high strength of the fine crystals and thin glass interlayers; the limit of this strength is the theoretical strength, and also the strength of the bonding between the fine crystals (generally speaking, metastable phases) and the glass (small), so that the development of cracks along the crystal boundaries is hindered. A pyroceramic is a metastable glass-crystalline system: the transition to a stable, equilibrium state on long exposures to high temperatures leads to a decline in the properties of the pyroceramic because recrystallization and the consequent impairment of bonding take place. Orig. art. has: 9 formulas.

ASSOCIATION: none

SUBMITTED: 21Dec65 ENCL: 00 SUB CODE: MT

NO REF SOV: 010 OTHER: 000

Card 2/2

L 00461-66 EWT(m)/EWP(1)/EWP(b)/EWP(s) WH/GS

ACCESSION NR: AT5013391 UR/0000/65/000/000/0124/0134

AUTHOR: Kalinina, A. M.; Filipovich, V. N.

TITLE: Study of the crystallization sequence during heating of lithium aluminosilicate glasses

SOURCE: AN SSSR. Institut khimii silikatov. Strukturnyye prevrashcheniya v steklakh pri povyshennykh temperaturakh (Structural transformations in glass at high temperatures). Moscow, Izd-vo Nauka, 1965, 124-134

TOPIC TAGS: glass crystallization, lithium aluminosilicate, lithium glass, glass structure, xray diffraction

ABSTRACT: The article is devoted to an x-ray diffraction study of the crystallization of certain glasses of the ternary system Li_2O-Al_2O_3-SiO_2 during heating starting at low temperatures. Low-temperature crystallization proceeds by overcoming the lowest energy barriers, which leads to the formation of metastable crystalline phases. On prolonged exposures to high temperatures, recrystallization into stable phases takes place in accordance with the phase diagram. Emphasis is placed on the close relationship between the structures of the initial glass and the crystalline phases which first precipitate at low temperatures. It is concluded that glass of the spodumene composition and other

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L 00461-66

ACCESSION NR: AT5013391

glasses with a medium aluminum oxide content (4--17 mole %) have a "eucryptite-like" or "β-quartz" structure. The passive role of ions of low diffusing tendency in low-temperature crystallization processes is noted. The cracking of glass during crystallization is attributed to the remaining β-eucryptite-type phases and of a solid solution of aluminum and lithium in β-quartz. Orig. art. has: 4 figures and 1 table.

ASSOCIATION: none

SUBMITTED: 21Dec64 ENCL: 00 SUB CODE: MT

NO REF SOV: 005 OTHER: 007

Card 2/2

L 38620-65 EWT(m)/EWP(e)/EWP(b) Pq-4 WH
ACCESSION NR: AP5008103 S/0062/65/000/002/0221/0231

AUTHOR: Kalinina, A. M.; Filipovich, V. N.

TITLE: A study of the crystallization sequence during heating of lithium aluminosilicate glasses

SOURCE: AN SSSR. Izvestiya. Seriya khimicheskaya, no. 2, 1965, 221-231

TOPIC TAGS: glass crystallization, crystallization sequence, lithium glass, aluminum glass, lithium aluminum silicate, xray diffraction, spodumene, eucryptite, quartz

ABSTRACT: The paper is devoted to an x-ray diffraction study of the crystallization of certain lithium aluminosilicate glasses, which were subjected to heat treatment. From the standpoint of the precipitating crystalline phases, the glasses were divided into the following three groups: (1) 2.1 to 3.9 mole % Al_2O_3 and 19.6 to 26.0 mole % Li_2O; (2) 9.14 to 21.3 mole % Al_2O_3 and 18.7 to 20.9 mole % Li_2O; (3) 3.5 mole % Al_2O_3 and 38.2 mole % Li_2O. It was found that low-temperature crystallization proceeds by overcoming the lowest energy barriers, resulting in the formation of metastable crystalline phases. After long exposures to high temperatures, recrystallization into stable phases takes place in conformity with

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L 33626-65
ACCESSION NR: AP5008103

the phase diagram. A close relationship was found between the structures of the initial glass and the crystalline phases which precipitate first at low temperature. It is concluded that glass having the composition of spodumene (in group 2) and other glasses with a medium aluminum content (4-17 mole %) have a "eucryptitelike" or "β-quartz" structure. The cracking of glass during crystallization is attributed to the formation of β-eucryptite type phases and of a solid solution of β-quartz. Orig. art. has: 4 figures and 1 table.

ASSOCIATION: Institut khimii silikatov im. I. V. Grebenshchikova Akademii nauk SSSR (Institute of Silicate Chemistry, Academy of Sciences, SSSR)

SUBMITTED: 11Mar63 ENCL: 00 SUB CODE: MT

NO REF SOV: 005 OTHER: 007

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AUTHOR: Kalinina, A. M.; Filipovich, V. N.

TITLE: Crystallization of glasses of the $CaO - MgO - SiO_2$ system

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 1, no. 7, 1965, 1189-1200

TOPIC TAGS: silicate glass, crystallization

ABSTRACT: The paper presents results of an X-ray diffraction study of crystallization of calcium magnesium silicate glasses during heating; for the purpose of determining their usefulness as starting substances for the development of new glass-crystalline materials. The glass compositions considered correspond to the two chemical compounds $CaO \cdot MgO \cdot 2SiO_2$ (diopside) and $2CaO \cdot MgO \cdot 2SiO_2$ (okermanite) and a series of eutectics. X-ray phase analysis was the principal method employed; additional methods were thermographic and microscopic analyses. The crystallization was carried out either by a single stage or a multistage thermal treatment. A tendency for metastable crystalline phases rich in alkaline earth oxides to precipitate first was observed. A possible interpretation of the lines obtained is given in terms of the chemically inhomogeneous structure of the

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melt and glass, and also in terms of the kinetics of fluctuational nucleation of a new crystalline phase in the complex glass. Orig. art. has: 5 figures and 2 tables.

ASSOCIATION: Institut khimii silikatov Akademii nauk SSSR (Institute of Silicate Chemistry, Academy of Sciences, SSSR)

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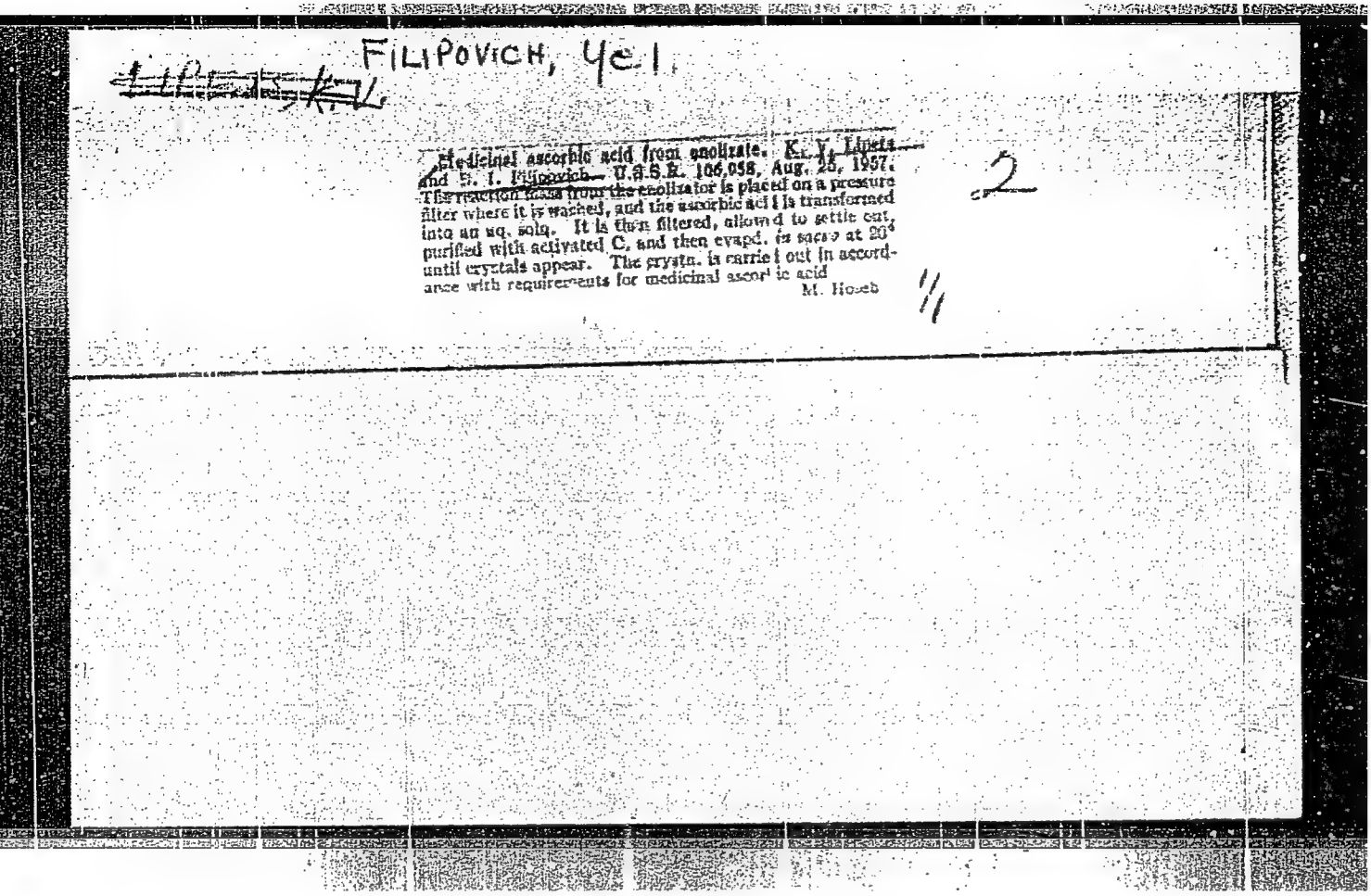

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M. Hoseb

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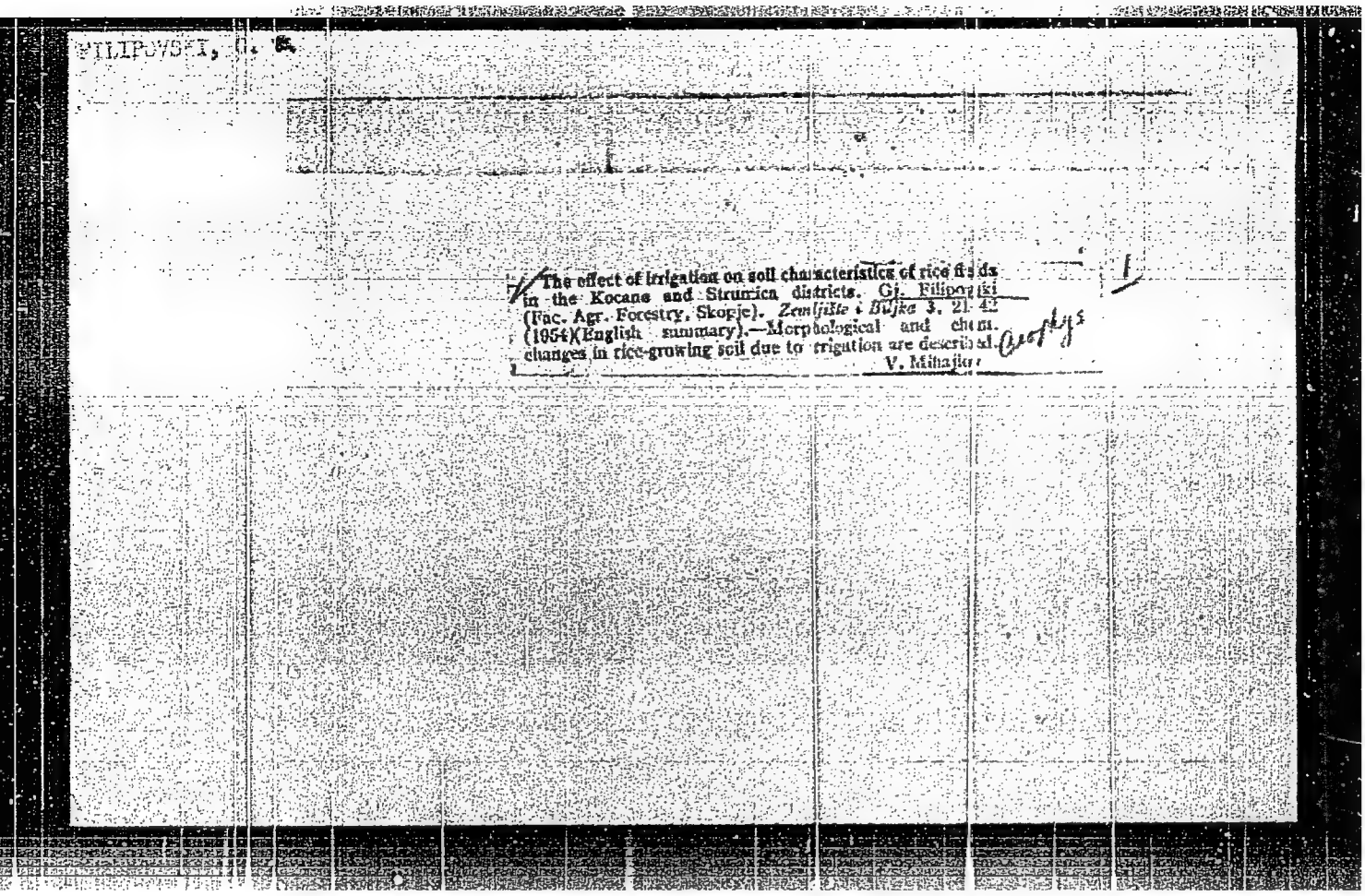

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